

Structural and Dynamic Properties of Polymerized Colloidal Crystalline Arrays

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Nanoparticles of silica or polystyrene have been incorporated in thin films of polymerized networks of poly(N-isopropylacrylamide). Random arrays of particles result when as-received colloidal particles in a high-salt solution are incorporated into the network. By contrast, if the salt is removed by dialysis, the Debye length increases to the point that electrostatic repulsion among the negatively charged nanoparticles leads to an ordered array. These systems have been characterized by several techniques. Optical absorption spectroscopy allows determination of the nanoparticle spacing in the ordered arrays. Small angle x-ray scattering measurements provide information about the roughness of adsorbed polymer on the nanoparticles. Dynamic mechanical measurements lead to an improved understanding of the particle-polymer interactions.